

REMARKS

The Examiner allowed claims 14-16. Applicants gratefully acknowledge the Examiner's indication of allowed subject matter.

The Examiner objected to claims 3-11 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The Examiner rejected claims 1, 2, 12 and 13 under 35 U.S.C. §103(a) as allegedly being unpatentable over Liu *et al.* (U.S. Patent No. 6,380,095), in view of Flanner *et al.* (U.S. Patent No. 6,653,734).

Applicants respectfully traverse the §103 rejections with the following arguments.

35 U.S.C. §103(a)

The Examiner rejected claims 1, 2, 12 and 13 under 35 U.S.C. §103(a) as allegedly being unpatentable over Liu *et al.* (U.S. Patent No. 6,380,095), in view of Flanner *et al.* (U.S. Patent No. 6,653,734).

Applicants respectfully contend that claim 1 is not unpatentable over Liu in view of Flanner, because Liu in view of Flanner does not teach or suggest each and every feature of claim 1. For example, Liu in view of Flanner does not teach or suggest the feature “(c) ... forming a second plurality of deep trenches...wherein...the step of etching the bottom portion of the hard mask opening is performed according to a second set of etching parameters, wherein the second set of etching parameters are adjusted from the first set of etching parameters such that, for each trench of the second plurality of deep trenches, **a side wall of the bottom portion of the hard mask opening is more vertical than that corresponding to a trench of the first plurality of deep trenches.**” (bold emphasis added).

The Examiner alleged at the beginning of bullet #5 that “Liu teaches that the lateral etching of the overlying hard mask layers can cause the taper of the trench to deviate from the specified angle range (column 8, lines 47-54).” These cited texts of Liu may indicate that the etching (and enlargement) of the hard mask opening is not good. However, these cited texts do not teach or suggest an incentive for **a more vertical side wall of the bottom portion of the hard mask opening** as claimed in claim 1.

The Examiner also alleged in bullet #5 that “Liu further teaches that volumetric gas ratio and other etching parameters can be varied (column 5, lines 22-48) to reduce erosion of the patterned mask (column 5, lines 17-22).” These cited texts of Liu may indicate that the expansion of the hard mask opening is not good. However, these cited texts do not teach or

suggest an incentive for a **more vertical side wall of the bottom portion** of the hard mask opening as claimed in claim 1.

The Examiner also alleged in bullet #5 that "Moreover, Flander teaches that faceting on the walls of hard mask layer (104) can result in an undesirable enlargement of the trench to be etched (column 4, lines 47-60; Figure 4)." These cited texts of Flanner may indicate that the enlargement of the hard mask opening is not good. However, these cited texts do not teach or suggest an incentive for a **more vertical side wall of the bottom portion** of the hard mask opening as claimed in claim 1.

The Examiner also alleged in bullet #5 that "One who is skilled in the art would be further motivated to select an etching composition that produces the desired angle range, such as optimizing Liu's etching steps to produce a smooth hard mask layer sidewall." Applicants agree that a smooth hard mask opening sidewall is good, but that fact does not teach or suggest an incentive for a **more vertical side wall of the bottom portion** of the hard mask opening as claimed in claim 1.

In summary, Liu in view of Flanner may allegedly teach or suggest some incentive to (a) avoid expanding the hard mask opening, (b) achieve a smooth hard mask opening sidewall, and (c) achieve a desired angle range for the entire sidewall of the hard mask opening. However, Liu in view of Flanner does not teach or suggest an incentive for a **more vertical side wall of the bottom portion** of the hard mask opening as claimed in claim 1.

Based on the preceding arguments, Applicants respectfully maintain that claim 1 is not unpatentable over Liu in view of Flanner, and that claim 1 is in condition for allowance.

As for the rejection of claim 2 in bullet #6, since claim 2 depends from claim 1, Applicants contend that claim 2 is likewise in condition for allowance.

Moreover, Liu in view of Flanner does not teach or suggest the feature “(c) ... forming a third plurality of deep trenches...wherein...the step of etching the bottom portion of the hard mask opening is performed according to a third set of etching parameters, wherein the third set of etching parameters are adjusted from the second set of etching parameters such that, for each trench of the third plurality of deep trenches, **a side wall of the bottom portion of the hard mask opening is more vertical** than that corresponding to a trench of the second plurality of deep trenches.” (bold emphasis added).

Because step (c) of claim 2 is similar to step (c) of claim 1, the arguments above for claim 1 are also applicable to claim 2. As a result, although Liu in view of Flanner may allegedly teach or suggest some incentive to (a) avoid expanding the hard mask opening, (b) achieve a smooth hard mask opening sidewall, and (c) achieve a desired angle range for the entire sidewall of the hard mask opening. However, Liu in view of Flanner does not teach or suggest an incentive for a **more vertical side wall of the bottom portion of the hard mask opening** as claimed in claim 2.

As for the rejection of claims 12 and 13 in bullets #7 and #8, respective, since claims 12 and 13 depend from claim 1, Applicants contend that claims 12 and 13 are likewise in condition for allowance.

CONCLUSION

Based on the preceding arguments, Applicants respectfully believe that all pending claims and the entire application meet the acceptance criteria for allowance and therefore request favorable action. If the Examiner believes that anything further would be helpful to place the application in better condition for allowance, Applicants invites the Examiner to contact Applicants' representative at the telephone number listed below. The Director is hereby authorized to charge and/or credit Deposit Account No. 09-0456.

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